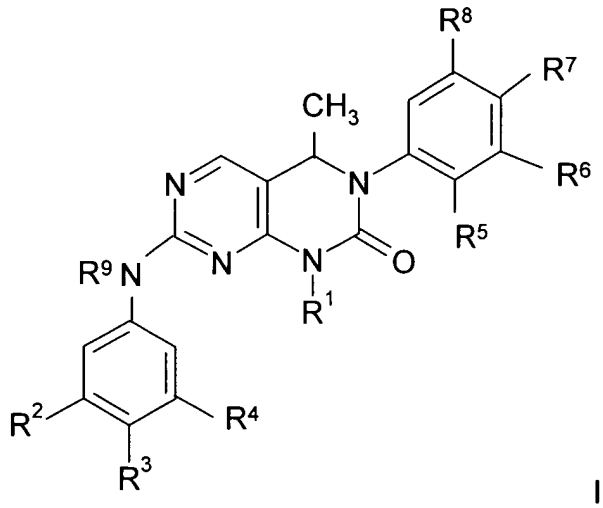
CLAIMS

What is Claimed is:

1. A compound of formula:



I,

or a pharmaceutically acceptable salt thereof, wherein

R^1 is selected from the group

H,

C_{1-10} alkyl,

C_{1-10} alkyl substituted by up to three groups selected from aryl, cycloalkyl, heteroaryl, heterocycle, $NR^{10}R^{11}$, OR^{12}, SR^{12}, halogen, COR^{13}, CO_2R^{13}, $CONR^{13}R^{14}$, $SO_2NR^{13}R^{14}$, SOR^{13}, SO_2R^{13}, CN and NO_2, wherein the aryl, cycloalkyl, heteroaryl, and heterocycle groups may each independently be substituted by up to three groups selected from $NR^{10}R^{11}$, OR^{12}, SR^{12}, , halogen, COR^{13}, CO_2R^{13}, $CONR^{13}R^{14}$, $SO_2NR^{13}R^{14}$, SOR^{13}, SO_2R^{13}, CN and NO_2,

aryl,

aryl substituted by up to three groups selected from lower alkyl, $NR^{10}R^{11}$, OR^{12}, SR^{12}, , halogen, COR^{13}, CO_2R^{13}, $CONR^{13}R^{14}$, $SO_2NR^{13}R^{14}$, SOR^{13}, SO_2R^{13}, CN and NO_2,

heteroaryl,

heteroaryl substituted by up to three groups selected from lower alkyl, $NR^{10}R^{11}$, , OR^{12}, SR^{12}, halogen, COR^{13}, CO_2R^{13}, $CONR^{13}R^{14}$, $SO_2NR^{13}R^{14}$, SOR^{13}, SO_2R^{13}, CN and NO_2,

heterocycle,

heterocycle substituted by up to three groups selected from lower alkyl, $NR^{10}R^{11}$, OR^{12}, SR^{12}, halogen, COR^{13}, CO_2R^{13}, $CONR^{13}R^{14}$, $SO_2NR^{13}R^{14}$, SOR^{13}, SO_2R^{13}, CN and NO_2,

C_{3-10} cycloalkyl,

C_{3-10} cycloalkyl substituted by up to three groups selected from lower alkyl $NR^{10}R^{11}$, OR^{12}, SR^{12}, halogen, COR^{13}, CO_2R^{13}, $CONR^{13}R^{14}$, $SO_2NR^{13}R^{14}$, SOR^{13}, SO_2R^{13}, CN and NO_2,

C_{2-10} alkenyl,

C_{2-10} alkenyl substituted by up to three groups selected from $NR^{10}R^{11}$, OR^{12}, SR^{12}, halogen, COR^{13}, CO_2R^{13}, $CONR^{13}R^{14}$, $SO_2NR^{13}R^{14}$, SOR^{13}, SO_2R^{13}, CN and NO_2, and

C_{2-10} alkynyl, substituted by up to three groups selected from $NR^{10}R^{11}$, OR^{12}, SR^{12}, halogen, COR^{13}, CO_2R^{13}, $CONR^{13}R^{14}$, $SO_2NR^{13}R^{14}$, SOR^{13}, SO_2R^{13}, CN and NO_2;

R^2, R^3 and R^4 are independently selected from the group consisting of

H,

halogen,

COR^{13},

CO_2R^{13},

$CONR^{13}R^{14}$,

$SO_2NR^{13}R^{14}$,

SOR^{13},

SO_2R^{13},

CN, and

NO_2;

R^5, R^6, R^7 and R^8 are independently selected from the group

H,

lower alkyl,

lower alkyl substituted by hydroxy or alkoxy,

$NR^{15}R^{16}$,

OH,

OR^{17},

SR^{17},

halogen,

COR^{17},

CO_2R^{17},

$CONR^{17}R^{18}$,

$SO_2NR^{17}R^{18}$,

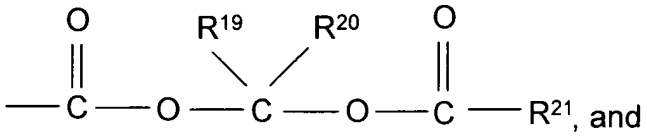
SOR^{17},

SO_2R^{17}, and

CN;

R^9 is selected from the group

H,



, and

COR^{17};

R^{10} and R^{11} are independently selected from the group

H,

COR^{13},

CO_2R^{13},

$CONR^{13}R^{14}$,
SO_2R^{13},
$SO_2NR^{13}R^{14}$,
lower alkyl,
lower alkyl substituted by hydroxy, alkoxy or $NR^{15}R^{16}$,
cycloalkyl,
cycloalkyl substituted by hydroxy, alkoxy, lower alkyl, or $NR^{15}R^{16}$,
heterocycle, and
heterocycle substituted by hydroxy, alkoxy, lower alkyl, or $NR^{15}R^{16}$,

or, alternatively, $NR^{10}R^{11}$ can form a ring having 3 to 7 atoms, said ring optionally including one or more additional hetero atoms and being optionally substituted by the group consisting of one or more lower alkyl, OR^{12}, COR^{13}, CO_2R^{13}, $CONR^{13}R^{14}$, SOR^{13}, SO_2R^{13}, and $SO_2NR^{13}R^{14}$;

R^{12} is selected from the group
H,
lower alkyl,
COR^{13},
$CONR^{13}R^{14}$,
C_{2-6} alkyl substituted by hydroxy, alkoxy, or $NR^{15}R^{16}$, cycloalkyl,
cycloalkyl substituted by hydroxy, alkoxy, lower alkyl, or $NR^{15}R^{16}$,
heterocycle, and
heterocycle substituted by hydroxy, alkoxy, lower alkyl, or $NR^{15}R^{16}$;

R^{13} and R^{14} are independently selected from the group
H,
lower alkyl,
C_{2-6} alkyl substituted by hydroxy, alkoxy, or $NR^{15}R^{16}$,
cycloalkyl,
cycloalkyl substituted by hydroxy, alkoxy, lower alkyl, or $NR^{15}R^{16}$,

heterocycle, and

heterocycle substituted by hydroxy, alkoxy, lower alkyl, or $NR^{15}R^{16}$,

or , alternatively, $NR^{13}R^{14}$ can form a ring having 3 to 7 atoms, said ring optionally including one or more additional hetero atoms and being optionally substituted by the group consisting of one or more lower alkyl, OR^{17}, COR^{17}, CO_2R^{17}, $CONR^{17}R^{18}$, SO_2R^{17}, and $SO_2NR^{17}R^{18}$;

R^{15} is selected from the group

H,

lower alkyl,

COR^{17}, and

CO_2R^{17}; and

R^{16}, R^{17} and R^{18} are independently selected from the group

H, and

lower alkyl,

or, alternatively, $NR^{15}R^{16}$ and $NR^{17}R^{18}$ can each independently form a ring having 3 to 7 atoms, said ring optionally including one or more additional hetero atoms;

R^{19} and R^{20} are independently selected from the group

H, and

lower alkyl; and

R^{21} is selected from

lower alkyl, and

C_{2-6} alkyl substituted by hydroxy, alkoxy or $NR^{15}R^{16}$,

or a pharmaceutically acceptable salt thereof.

2. The compound of claim 1 wherein R^1 is selected from aryl and aryl substituted by OR^{12} or $CONR^{13}R^{14}$.

3. The compound of claim 1 wherein R^1 is selected from lower alkyl and C_{2-6} alkyl substituted by OR^{12} or $CONR^{13}R^{14}$.

4. The compound of claim 2 wherein R^2 is H.

5. The compound of claim 3 wherein R^2 is H.

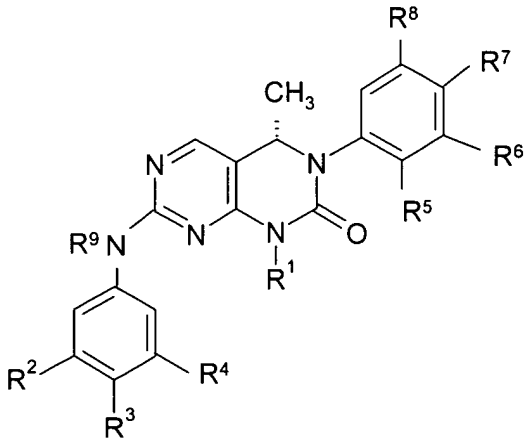
6. The compound of claim 1 wherein R^3 is H.

7. The compound of claim 1 wherein R^2 and R^3 are H.

8. The compound of claim 1 wherein R^2, R^3 and R^4 are H.

9. The compound of claim 1 wherein R^3 is halogen.

10. The compound of claim 1 having the formula



Ia.

11. A compound selected from the group:

(±)-3-(4-Methoxy-phenyl)-4-methyl-1-phenyl-7-phenylamino-3,4-dihydro-1H-pyrimido[4,5-d]pyrimidin-2-one;

3-(4-Methoxy-phenyl)-4-(*R*)-methyl-1-phenyl-7-phenylamino-3,4-dihydro-1H-pyrimido[4,5-d]pyrimidin-2-one;

3-(4-Methoxy-phenyl)-4-(*S*)-methyl-1-phenyl-7-phenylamino-3,4-dihydro-1H-pyrimido[4,5-d]pyrimidin-2-one;

(±)-1,3-Bis-(4-methoxy-phenyl)-4-methyl-7-phenylamino-3,4-dihydro-1H-pyrimido[4,5-d]pyrimidin-2-one;

(±)-3-[3-(4-Methoxy-phenyl)-4-methyl-2-oxo-7-phenylamino-3,4-dihydro-2H-pyrimido[4,5-d]pyrimidin-1-yl]-benzonitrile; and

(±)-3-[3-(4-Methoxy-phenyl)-4-methyl-2-oxo-7-phenylamino-3,4-dihydro-2H-pyrimido[4,5-d]pyrimidin-1-yl]-benzamide.

12. A compound selected from the group:

(±)-3-(2-Fluoro-4-methoxy-phenyl)-4-methyl-1-phenyl-7-phenylamino-3,4-dihydro-1H-pyrimido[4,5-d]pyrimidin-2-one;

(±)-3-[3-(2-Fluoro-4-methoxy-phenyl)-4-methyl-2-oxo-7-phenylamino-3,4-dihydro-2H-pyrimido[4,5-d]pyrimidin-1-yl]-benzonitrile;

(±)-3-[3-(2-Fluoro-4-methoxy-phenyl)-4-methyl-2-oxo-7-phenylamino-3,4-dihydro-2H-pyrimido[4,5-d]pyrimidin-1-yl]-benzamide;

(±)-3-(2-Chloro-5-methoxy-phenyl)-4-methyl-1-phenyl-7-phenylamino-3,4-dihydro-1H-pyrimido[4,5-d]pyrimidin-2-one; and

1-(2-Hydroxy-1-(*S*)-methyl-ethyl)-3-(4-methoxy-phenyl)-4-methyl-7-phenylamino-3,4-dihydro-1H-pyrimido[4,5-d]pyrimidin-2-one.

13. A compound selected from the group:

1-(2-Hydroxy-1-(*R*)-methyl-ethyl)-3-(4-methoxy-phenyl)-4-(*R*)-methyl-7-phenylamino-3,4-dihydro-1H-pyrimido[4,5-d]pyrimidin-2-one;

1-(2-Hydroxy-1-(*R*)-methyl-ethyl)-3-(4-methoxy-phenyl)-4-(*S*)-methyl-7-phenylamino-3,4-dihydro-1H-pyrimido[4,5-d]pyrimidin-2-one;

3-(4-Methoxy-phenyl)-4-methyl-7-phenylamino-1-[1-(*S*)-phenyl-ethyl]-3,4-dihydro-1H-pyrimido[4,5-d]pyrimidin-2-one;

(±)-*N*-[6-(4-Methoxy-phenyl)-5-methyl-7-oxo-8-phenyl-5,6,7,8-tetrahydro-pyrimido[4,5-d]pyrimidin-2-yl]-*N*-phenyl-acetamide; and

(±)-1-(*trans*-4-Hydroxy-cyclohexyl)-3-(4-methoxy-phenyl)-4-methyl-7-phenylamino-3,4-dihydro-1H-pyrimido[4,5-d]pyrimidin-2-one.

14. A compound selected from the group:

1-[(1*R*,3*R*)-3-Hydroxy-cyclopentyl]-3-(4-methoxy-phenyl)-4-(*S*)-methyl-7-phenylamino-3,4-dihydro-1H-pyrimido[4,5-d]pyrimidin-2-one;

1-[(1*S*,3*S*)-3-Hydroxy-cyclopentyl]-3-(4-methoxy-phenyl)-4-(*S*)-methyl-7-phenylamino-3,4-dihydro-1H-pyrimido[4,5-d]pyrimidin-2-one;

7-(4-Fluoro-phenylamino)-1-[(1*R*,3*R*)-3-hydroxy-cyclopentyl)]-3-(4-methoxy-phenyl)-4-(*S*)-methyl-3,4-dihydro-1H-pyrimido[4,5-d]pyrimidin-2-one;

7-(4-Fluoro-phenylamino)-1-[(1*S*,3*S*)-3-hydroxy-cyclopentyl)]-3-(4-methoxy-phenyl)-4-(*S*)-methyl-3,4-dihydro-1H-pyrimido[4,5-d]pyrimidin-2-one;

7-(4-Fluoro-phenylamino)-1-(2-hydroxy-1-(*R*)-methyl-ethyl)-3-(4-methoxy-phenyl)-4-(*S*)-methyl-3,4-dihydro-1H-pyrimido[4,5-d]pyrimidin-2-one;

3-(4-Chloro-phenyl)-7-(4-fluoro-phenylamino)-1-(2-hydroxy-1-(*R*)-methyl-ethyl)-4-(*S*)-methyl-3,4-dihydro-1H-pyrimido[4,5-d]pyrimidin-2-one;

3-(4-Chloro-2-fluoro-phenyl)-7-(4-fluoro-phenylamino)-1-(2-hydroxy-1-(*R*)-methyl-ethyl)-4-(*S*)-methyl-3,4-dihydro-1H-pyrimido[4,5-d]pyrimidin-2-one;

3-(4-Chloro-phenyl)-1-(2-hydroxy-1-(*R*)-methyl-ethyl)-4-(*S*)-methyl-7-phenylamino-3,4-dihydro-1H-pyrimido[4,5-d]pyrimidin-2-one;

3-(4-Chloro-2-fluoro-phenyl)-1-(2-hydroxy-1-(R)-methyl-ethyl)-4-(S)-methyl-7-phenylamino-3,4-dihydro-1H-pyrimido[4,5-d]pyrimidin-2-one;

3-(4-Chloro-phenyl)-1-(3-hydroxy-2-(*S*)-methyl-propyl)-4-(*S*)-methyl-7-phenylamino-3,4-dihydro-1H-pyrimido[4,5-d]pyrimidin-2-one; and

3-(4-Chloro-2-fluoro-phenyl)-1-(3-hydroxy-2-(*S*)-methyl-propyl)-4-(*S*)-methyl-7-phenylamino-3,4-dihydro-1H-pyrimido[4,5-d]pyrimidin-2-one.

15. A pharmaceutical composition comprising a therapeutically effective amount of a compound of claim 1 and a pharmaceutically acceptable carrier or excipient.

16. A method for treating cancer comprising administering to a patient in need of such treatment a therapeutically effective amount of a compound of claim 1.

17. A method of controlling cancer comprising administering to a patient in need of such treatment a therapeutically effective amount of a compound of claim 1.

18. The method of claim 16 wherein the cancer is breast, lung, colon or prostate cancer.

19. The method of claim 17 wherein the cancer is breast or colon cancer.

20. A compound selected from the group:

(±)-[1-(2,4-Dichloro-pyrimidin-5-yl)-ethyl]-(4-methoxy-phenyl)-amine;

(±)-7-Chloro-3-(4-methoxy-phenyl)-4-methyl-1-phenyl-3,4-dihydro-1H-pyrimido[4,5-d]pyrimidin-2-one;

(±)-{2-Chloro-5-[1-(4-methoxy-phenylamino)-ethyl]-pyrimidin-4-yl}-(4-methoxy-phenyl)-amine;

(±)-7-Chloro-1,3-bis-(4-methoxy-phenyl)-4-methyl-3,4-dihydro-1H-pyrimido[4,5-d]pyrimidin-2-one;

(±)-3-[7-Chloro-3-(4-methoxy-phenyl)-4-methyl-2-oxo-3,4-dihydro-2H-pyrimido[4,5-d]pyrimidin-1-yl]-benzonitrile;

(±)-[1-(2,4-Dichloro-pyrimidin-5-yl)-ethyl]-(2-fluoro-4-methoxy-phenyl)-amine;

(±)-7-Chloro-3-(2-fluoro-4-methoxy-phenyl)-4-methyl-1-phenyl-3,4-dihydro-1H-pyrimido[4,5-d]pyrimidin-2-one;

(±)-3-[7-Chloro-3-(2-fluoro-4-methoxy-phenyl)-4-methyl-2-oxo-3,4-dihydro-2H-pyrimido[4,5-d]pyrimidin-1-yl]-benzonitrile; and

(±)-(2-Chloro-5-methoxy-phenyl)-[1-(2,4-dichloro-pyrimidin-5-yl)-ethyl]-amine.

21. A compound selected from the group:

(±)-7-Chloro-3-(2-chloro-5-methoxy-phenyl)-4-methyl-1-phenyl-3,4-dihydro-1H-pyrimido[4,5-d]pyrimidin-2-one;

1-[2-(*tert*-Butyl-diphenyl-silanyloxy)-1-(*S*)-methyl-ethyl]-7-chloro-3-(4-methoxy-phenyl)-4-methyl-3,4-dihydro-1H-pyrimido[4,5-d]pyrimidin-2-one;

3-[2-*tert*-Butyl-diphenyl-silanyloxy-1-(*R*)-methyl-ethyl]-1-(*R*)-[1-(2,4-dichloropyrimidin-5-yl)-ethyl]-1-(4-methoxyphenyl)-urea;

3-[2-*tert*-Butyl-diphenyl-silanyloxy-1-(*R*)-methyl-ethyl]-1-(*S*)-[1-(2,4-dichloropyrimidin-5-yl)-ethyl]-1-(4-methoxyphenyl)-urea;

1-[2-(*tert*-Butyl-diphenyl-silanyloxy)-1-(*R*)-methyl-ethyl]-7-chloro-3-(4-methoxy-phenyl)-(*R*)-4-methyl-3,4-dihydro-1H-pyrimido[4,5-d]pyrimidin-2-one;

1-[2-(*tert*-Butyl-diphenyl-silanyloxy)-1-(*R*)-methyl-ethyl]-7-chloro-3-(4-methoxy-phenyl)-4-(*S*)-methyl-3,4-dihydro-1H-pyrimido[4,5-d]pyrimidin-2-one;

1-[1-(2,4-Dichloro-pyrimidin-5-yl)-ethyl]-1-(4-methoxy-phenyl)-3-[1-(*S*)-phenyl-ethyl]-urea; and

7-Chloro-3-(4-methoxy-phenyl)-4-methyl-1-[1-(*S*)-phenyl-ethyl)-3,4-dihydro-1H-pyrimido[4,5-d]pyrimidin-2-one.